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## FACTORS IN ACHIEVEMENT

By Dr. P. G. NUTTING

IN the increase and diffusion of organized knowledge and in its application to special problems for the national welfare, the selection and training of individuals of course plays an important part. The capacity for unusual achievements is in part born in the individual and in part the result of his environment, (1) inherited tendencies and (2) education in a broad sense. The individual favored in both respects with capacity for achievement may or may not accomplish great results according to the (3) incentives to activity he may possess or develop and according to certain (4) fortuitous factors, ideas and impulses coming apparently from nowhere, which may influence his choice of activities.

From the point of view of practical work, the capacity for success depends almost entirely upon but two factors—fertility of mind to originate ideas and judgment to select from these the most vital and effective. With an energetic use of both, worthy achievement is assured, the importance of activity and practical experience lying in the fact that its effects are strongly cumulative, each bit of experience enhancing ability to achieve more. Hence, the considerable effect on national achievement of such an apparently trivial factor as climate. In a well-organized democracy, each individual should have equal opportunity to acquire (1) knowledge through study, assimilation and deduction of fundamental principles, (2) skill through application of these principles to practical problems and (3) incentives to productive effort. These are the essential qualifications of the expert and since, in any highly efficient democracy, all problems of moment must be handled by experts, the fundamental problem is the application of organized knowledge to bring about such a condition, the “rule of common sense.”

1. *Inherited Tendencies.*—With equal opportunity to acquire knowledge and skill, the proper choice of vocation depends chiefly upon inherited traits. Usually but a few traits are dominant and the proper vocation is not difficult to determine within rather narrow limits. An occasional individual possesses a wide variety of overlapping tendencies and is

capable of achievement in a variety of callings. Many others exhibit no dominant mental characteristics, being fitted only for work in the less skilled crafts and trades.

As stated above, the ability to grasp and correlate ideas is a proper measure of mental power. Now some classes of ideas are better and preferably correlated than others and this preference is a necessary and sufficient criterion of natural fitness. The musician is keen in associating auditory impressions, the mathematician in abstract logic, the physicist and chemist in physical and chemical laws, and so on. This choice of class or classes of ideas to be correlated is instinctive in that it is born, not made, and characteristic in that it is not precisely the same in any two individuals. It varies with age, but at a given age (say twenty) it is a safe basis of judgment. The somewhat detailed classification below will at least illustrate the application of this principle.

The *creative* type of mind is probably the least complex. The scientist, artist, engineer and professional man must be capable of a high degree of abstraction, hence must be individualistic rather than gregarious in his tastes. The ideas which dwell in the mind of the writer and which he instinctively ponders and correlates are stories and plots. The artist is keen on form and color—visual impressions—the musician on sounds. The ideas which grip the mind of the scientist are abstract fundamental relations between cause and effect. The engineer and professional man in general ponder concrete problems and applications of fundamental principles. It is even possible to differentiate between the lawyer, the physician, the agriculturalist, the mechanical engineer, the banker and other types of engineer in early youth by means of the tastes which they exhibit for different classes of problems.

On the other hand, the *administrative* types, be they commercial, political, protective or pedagogical, are gregarious rather than individualistic. Their tastes do not run to abstract ideas so much as to personal relations. They are keen to make and keep friends, are good “mixers” and entertainers, fond of activity and are experts on behavior. The commercial type of individual instinctively suppresses his own feelings and wishes to please others—and make a sale. The executive type is keen to anticipate conditions and relations between others. The good teacher is fond of the society of those less well informed and keen on making his own ideas plain to others. He must of course have a goodly supply of certain classes of ideas and be a good practical psychologist.

In addition to determining fitness for a particular life work, inherited traits have a great deal to do with eminence in a given calling, although perhaps not dominant factors. Fertility of mind, ease of assimilation of new ideas, the tendency to activity and general smoothness and precision of mental operation are largely born in the individual rather than acquired and have a great deal to do with success in life. All are usually in evidence in early youth, if at all. None are of consequence, of course, unless coupled with a proper education, mental, physical and moral, and with proper incentives to activity. And all these characteristics, whether inherited or acquired, are of little avail without an intimate knowledge of the complex conditions of modern life obtained by daily contact with them.

2. *Acquired Knowledge.*—To be a vital factor in achievement, education should provide not only a book knowledge of fundamental principles, but skill in applying these principles. One extreme of education is represented by the individual with purely academic training, resulting in mere breadth and depth of impotent knowledge, possessing neither the ability nor the incentive to use it. At the other extreme is the self-made individual with a thorough first-hand knowledge of certain classes of problems and of certain basic principles applicable to them. There can be no question as to which is of greater value to the nation, but both are far from ideal.

The best education consists in a steady, life-long assimilation of ideas coupled with a deduction of principles. The acquisition of learning should go hand in hand with an application of that learning to special problems. The natural method is (1) the analysis of a problem, (2) the application of known principles followed by (3) the deduction of new principles or extensions of the old. The laboratory method used in teaching most sciences in this country is a close approximation to this method. The older education, aiming at training in interpretation and expression, was good as far as it went in a certain field of achievement, but the field was narrow. The best education should provide the maximum knowledge, skill and incentive possible to the individual in his chosen field of endeavor. Its aim is to produce experts—experts in the application of fundamental principles. Its methods are to teach those principles through their application. And the most important part of the education is the inculcation of the principle of the method itself. Agassiz taught the gold expert by giving him a turtle to study! He learned the method and this knowledge with the fixed purpose of becoming an expert and doubtless con-

siderable natural ability were the essential factors in his success.

Our students waste much valuable time and learn wrong methods of study because our system leads them to work by the day rather than by the job. The installation of a piece-work system would require better teachers and probably more of them, but would result in incalculable benefit to the nation and a great saving of time to the student. Students who attend college chiefly for the social or athletic advantages it offers should not be tolerated. Teachers should be thoroughly versed in the basic principles of the branch taught and in the proper methods of acquiring knowledge. Whether the subject taught be mathematics, language or biology the first aim should be to see that the student gains a real command of the subject. Proper teaching will result in better teachers and finally in better taught students.

3. *Incentives to Activity*.—Under normal conditions the average individual operates on low gear, seldom rising even to second. Any one who habitually operates on high and is reasonably endowed with intelligence and common sense is reasonably certain of great achievement. Our present problem is to outline the incentives tending to induce us to put forth our best efforts. If we but put forth our best efforts, our future is assured, either as individuals or as a nation.

Take the most talented and energetic scientist and isolate him, say on a desert island. Give him a library and a laboratory, but no companions and in a few months or years he will run dry of ideas and become barren. We are so constituted that continued productiveness is conditional upon intercourse with our colleagues. In many respects our activities are like the individual cells in our muscles—we function properly only in contact and cooperation with our fellows. The problem of incentives is therefore complex and primarily one of interrelations.

In any great achievement two factors are essential, a motive (or several motives) for doing it coupled with capacity to accomplish the desired results. In each motive may be recognized a more or less continuous incentive and an idea or impulse coming apparently from nowhere (*vide infra*). Every one has his favorite category of incentives. There are at least six classes of these and any scheme of classification is about as good as any other. From the purely *mechanical* point of view one is acted upon by various forces due to conditions existing among our surroundings. Life is a series of actions and re-

actions resulting from unbalanced forces. Action is greater or less according to inertia, plasticity and elasticity. Purely *physiological* considerations lead one to think of cell charge and discharge as the basis of activity. In health, rest and food lead to charged brain cells ready to react to a nerve stimulus. Impurities tend to break down these nerve cells in chains or groups, giving rise to definite ideas. Emotions tend to polarize the charged brain cells so that a more copious discharge may result.

From the standpoint of *mental* engineering our activities are a series of problems, many of these are nearly identical with problems solved many times previously and are largely taken care of by habit, while others are original and require working out. Ideas come to us and we follow them up through a logical chain to a definite end point. Unable to solve a problem, we take it up again and again, contact with the problem and with the work being a powerful incentive to continue. Our interest in any problem is in proportion to the possibilities we see in it and in lesser degree to the headway we are able to make with it.

Incentives are in better alignment from the *sociological* point of view. Our strongest incentives are the winning and retaining the respect and esteem of those with whom we are in contact. We are impelled (by instinct) to fill our place in the social organization much as a cell fills its place in a nerve or muscle. Those who care little or nothing for the esteem of their fellows are criminals and outlaws. To enhance the esteem of our fellows we contract to deliver certain results and, knowing the price of failure, the filling of our contract is a powerful incentive. The attainment of the social freedom usually connected with abundance of money is a powerful incentive to some. Emulation influences many. The strongest of all incentives are self-preservation and the stern necessity of living up to a standard, the standard of our fellows or one set by ourselves perhaps.

On an ethical or *moral* basis, our incentives are those of principle and duty. Our one fundamental duty is to be our best selves and live up to our possibilities. The hope of reward in the form of pleasure or happiness or the fear of discomfort are strong incentives in the less highly organized mind. To others, the satisfaction resulting from duty well performed is a sufficient incentive for any labor in achievement, even to the sacrifice of life itself.

From the *psychological* viewpoint, incentives plus impulses

are the stimuli to mental exertion. A series of more or less related impulses leaves in our minds that which is common to all of them in the form of a more or less permanent incentive. Upon that incentive depends the nature and extent of our reaction to fresh ideas as they come, our wish or will to develop the idea toward certain objectives or to suppress it into desuetude. We develop methods of inviting and forcing ideas of our choice, repeated reactions of similar nature lead to the formation of habits and of character. Experience teaches that the giving way to impulses of a certain nature (*e. g.*, that of doing our best) is always approved by our judgment and an incentive to continue the same behavior is formed. In other words, incentives determine the volitional choice of conduct. The volitional factor ranges from almost nothing in the case of the instinctive incentives to practically the whole of those incentives which are matters of judgment and principle. When under emotional stress we react much more readily and strongly along the lines of our dominant incentives.

Apparently, a strong line of good incentives can not be created; it must be built up by careful and persistent effort and that effort must itself be the result of incentive. With the adolescent, the aims and examples of friends and acquaintances and the teaching of parents are powerful formative factors. Youths pattern their lives after those they admire almost instinctively with little reason or judgment.

A powerful factor in achievement is the inhibition of such contra-incentives as habit. In a sense, men are like snakes and other reptiles—in order to make the best progress it is essential that they periodically shed a skin or shell of habit. A simple and natural method of doing this is to move into new surroundings and form new acquaintances from among a set of entire strangers. The formation of a new set of habits automatically dispenses with the old set. Fresh incentives arise and are given free play while old incentives are rejuvenated. By this means, achievement is frequently enhanced many fold.

The practical means of enhancing our incentives are very limited. We may stimulate ourselves to some extent by moving into new surroundings. We may contract with others or with ourselves to deliver certain results. No inconsiderable stimulus comes at times from merely getting started, mere contact with the work itself engendering interest and application. After the dominant point of view has once been located among the

six classes above outlined, best progress may be made by confining attention to that one line of appeal. If the boy tends to think in terms of moral principle appeal to his morals. If he is gregarious, teach him through his friends, and so on.

The strongest of all incentives—self-preservation, the struggle for existence, competitive rivalry and the instinct to attain and retain the respect of our fellows—lie nearly or quite beyond our control. But it is frequently quite possible to imagine these as existing in greater measure than is actually the case and so spur ourselves from the field of fatuous content into increased activity and achievement. The story is told of a hen that was unable of herself to fly over a fence, but by inducing a dog to chase her was able to clear the fence and to spare! The incentive of the hen roost was insufficient, but that of self-preservation was ample for the task to be accomplished.

4. *Fortuitous Factors in Achievement.*—Among the contributory factors leading up to any great event in the world's history may always be found ideas and impulses coming to certain individuals apparently from nowhere, vital in initiating whole series of events. Cæsar hesitated at the Rubicon, but finally obeyed the impulse to cross and end the Roman republic. Many a great war started from an impulse to conquer the world, coming to some individual ruler. Had Lincoln not obeyed the impulse to take on Douglas in debate, it is quite probable he would never have been president and one of the dominant characters in history. Any man of great achievement can recall many instances of fruitful lines of activity originating in some impulse. Since such impulses are frequently very important factors in achievement, it is well to scrutinize them with care, attempting to discover some general pattern, some laws of appearance and the best means of utilization.

Countless impulses come to every one during his whole life, dozens during each waking hour in fact. Of these, a considerable portion may be traced directly to suggestions made by our associates, others arise from our personal needs and desires. Many, however, simply flash into consciousness much as do words, faces or the solutions of problems. Impulses involving action are either inhibited or acted upon and our whole lives may hinge upon the result of the decision. Such impulses must be common to the whole animal world that is capable of voluntary action. They range in quality from mere reactions to abstract ideas and in number from a few per day to many per

minute. The frequency of occurrence of high-grade abstract ideas and impulses is a measure of mentality. That frequency is higher the more intimate our association with our fellows. During periods of isolation, in fact, we quickly run nearly dry of both ideas and impulses. The advanced civilization attained by the Greeks may be attributed in large measure to these gregarious habits of association and discussion, resulting in a stimulation of the production of ideas and impulses.

Every impulse involves a decision to do or not to do a certain thing or to do this rather than that. As we habitually lean toward decisions of a certain nature, our whole lives are affected. The one who is prone to follow up impulses involving activities just within the limits of his powers will make the most rapid progress, come nearest to living up to his possibilities and make the most of his life and endowments. This is the whole secret of useful activity, of having the correct philosophy of life to make the proper decisions between impulses of trained judgment and great achievements in general. A good teacher is one who begets impulses in his students to undertake difficult tasks and to do their best in accomplishing them. Inherited tendencies to have original ideas and impulses and to undertake carrying out the most telling of these are our most valuable heritages.

Of the influences at our command which breed valuable ideas and impulses, not much is known. Helmholtz stated that the solutions of difficult problems most frequently came to him in walking up a certain hill on a sunny morning. To most of us, however, such ideas and impulses doubtless come most frequently during animated discussions with our colleagues. Alcoholic beverages are notoriously inhibitive in their action. They may appear at the time to be effective, but cold judgment shows that this conclusion is illusory. Narcotics undoubtedly have a temporary stimulating effect on originality, but with reverse after effects. The incentives to activity discussed above are, almost without exception, effective in generating fresh ideas and impulses, productive effort and originality being developed together. Our judgment of fresh impulses in selecting those worthy of further effort is partly instinctive, largely the result of a philosophy of life (of what is most worth while) developed during adolescence and partly the result of education and experience. Happy is he who instinctively takes a broad and far-sighted view of what is best worth while and who strikes while the iron is hot.

*Summary.*—The individual of great achievements is one with the thorough grasp of fundamental principles of the scientist, the ability to analyze and solve difficult concrete problems of the engineer or the originality to conceive and the skill to create the ideal or approximations to the ideal of the artist. He requires a heritage of originality and keen vision, unerring judgment obtained by proper education and experience, tireless enthusiasm and energy to accomplish desirable ends and finally a continual flow of worth-while ideas and impulses. Any one with suitable inherited qualities, striving for a maximum of achievement and usefulness to the nation, may properly devote himself to the acquisition of sound judgment and of ample incentive to activity. Thus are experts made and the leading nation of the future will be a nation of experts occupied in furthering the interests of that nation.